

Rule:

- 1) Count the digits from decimal to START of repeating unit. Multiply by 1 followed by those number of Zeros.

eg:

$0.\overline{11231}$	(1000)
$0.\overline{125}$	(10)
$0.\overline{3}$	(1)

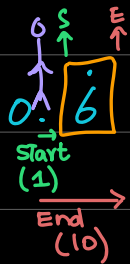
- 2) Count the digits from decimal to END of repeating unit. Multiply by 1 followed by those number of zeros.

eg:

$0.\overline{3165}$	(10000)
$0.\overline{12561}$	(100000)

- 3) Now Subtract both of these.
Must simplify the final fraction.

$$0.\overline{6} = 0.\dot{6} = 0.66666\ldots \Rightarrow \frac{2}{3}$$



$$x = 0.66666\ldots$$

$$\text{END: } 10x = 6.6666\ldots$$

$$\text{START: } -1x = -0.6666\ldots$$

$$9x = 6.0000$$

$$x = \frac{6}{9}$$

$$x = \frac{2}{3}$$

CONVERT RECURRING DECIMAL TO FRACTION

1) $2.\dot{1}6$

$2.\dot{1}6$
 ↑
 Recurring unit

$x = 2.166666\ldots$

Start
1dp (10)

END 2dp
(100)

END (2dp)	$100x = 216.6666\ldots$	} SUBTRACT
START (1dp)	$-10x = 21.6666\ldots$	
	$90x = 195.0$	

$90x = 195$

$x = \frac{195}{90} = \frac{39}{18} = \frac{13}{6}$

$x = \frac{13}{6}$

$$2) \quad 1.\overline{25} = 1.25555\dots$$

Start
1dp (10)

End 2dp
(100)

$$x = 1.25555\dots$$

$$\begin{array}{r} \text{End: } 100x = 125.5555\dots \\ \text{START: } - 10x = 12.5555\dots \end{array} \quad \left. \vphantom{\begin{array}{r} \text{End: } 100x = 125.5555\dots \\ \text{START: } - 10x = 12.5555\dots \end{array}} \right\} \text{SUBTRACT}$$

$$90x = 113.0000$$

$$90x = 113$$

$$x = \frac{113}{90}$$

③

1.3 41

Start (2dp)
(10)

End 3 dp
(1000)

$$x = 1.341414141 \dots$$

$$\begin{array}{r} \text{END:} \quad 1000x = 1341.414141 \dots \\ \text{START:} \quad - 10x = -13.414141 \dots \\ \hline 990x = 1328.000000 \end{array} \quad \left. \vphantom{\begin{array}{r} \text{END:} \\ \text{START:} \end{array}} \right\} \text{SUBTRACT}$$

$$x = \frac{1328}{990} \frac{664}{495}$$

$$x = \frac{664}{495}$$

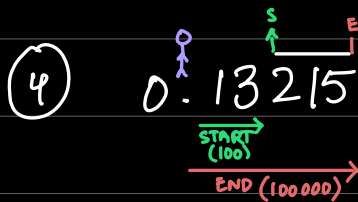
1 mark $\rightarrow$ (A1)

2 marks: (M1) (A1)

✓ ✓ (2 marks)

✓ X (1 mark)

X ✓ (zero)



$$x = 0.13215215215\dots$$

END: $100\,000x = 13215.215215215\dots$

START: $-100x = -13.215215215\dots$

$$99900x = 13202.000000$$

$$x = \frac{13202}{99900}$$

$$x = \frac{6601}{49950}$$

SURDS (SQUARE ROOTS)

(i) Simplify

$$\begin{array}{l} \text{(i)} \quad \sqrt{18} \\ \sqrt{9 \times 2} \\ \sqrt{9} \sqrt{2} \\ 3\sqrt{2} \end{array} \quad \begin{array}{l} \text{SQ} \\ 1 \\ 4 \\ 9 \\ 16 \\ 25 \\ 36 \\ 49 \\ \vdots \end{array}$$

$$\begin{array}{l} \text{(ii)} \quad \sqrt{180} \\ \sqrt{36 \times 5} \\ \sqrt{36} \sqrt{5} \\ 6\sqrt{5} \end{array} \quad \begin{array}{l} \text{SQ} \\ 1 \\ 4 \\ 9 \\ 16 \\ 25 \\ 36 \\ 49 \\ \vdots \end{array}$$

$$\begin{array}{l} \text{(iii)} \quad \sqrt{27} \\ \sqrt{9 \times 3} \\ \sqrt{9} \sqrt{3} \\ 3\sqrt{3} \end{array} \quad \begin{array}{l} \text{SQ} \\ 1 \\ 4 \\ 9 \\ 16 \\ 25 \\ 36 \\ 49 \\ \vdots \end{array}$$

(ii) ADD/SUB ONLY SAME SURDS CAN BE ADD/SUB

while adding/subtracting the surd part cannot change.

$$\text{(i)} \quad 3\sqrt{2} + 7\sqrt{2} = (3+7)\sqrt{2} = 10\sqrt{2}$$

$$\text{(ii)} \quad 12\sqrt{3} - 4\sqrt{3} = 8\sqrt{3}$$

$$\begin{array}{l} \text{(iii)} \quad 2\sqrt{8} + 5\sqrt{2} \\ 2(2\sqrt{2}) + 5\sqrt{2} \\ 4\sqrt{2} + 5\sqrt{2} \\ 9\sqrt{2} \end{array}$$

$$\begin{array}{l} \text{Simplify: } \sqrt{8} \\ \sqrt{4 \times 2} \\ \sqrt{4} \sqrt{2} \\ 2\sqrt{2} \end{array} \quad \begin{array}{l} \text{SQ} \\ 1 \\ 4 \\ 9 \\ 16 \\ 25 \\ \vdots \end{array}$$

$$\text{(iv)} \quad 12\sqrt{5} + 3\sqrt{5} = 15\sqrt{5}$$

$$\begin{array}{l} \text{(v)} \quad 2\sqrt{11} - 7\sqrt{11} = -5\sqrt{11} \\ (2-7)\sqrt{11} \end{array}$$

(iii) MULTIPLY

$$(i) \quad \sqrt{2} \times \sqrt{3} = \sqrt{2 \times 3} = \sqrt{6}$$

$$(ii) \quad 3\sqrt{2} \times 5\sqrt{3} = 15\sqrt{6}$$

$$(iii) \quad 5\sqrt{2} \times 4 = 20\sqrt{2}$$

IMP: (iv) **DIVIDE** MATHS PEOPLE HATE HAVING
SURDS IN DENOMINATOR OF A
FRACTION.

RATIONALIZATION: Process to bring surds in numerators.

$$(a) \quad \frac{3}{\sqrt{2}}$$

$$= \frac{3}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$

$$= \frac{3\sqrt{2}}{\sqrt{4}}$$

$$= \boxed{\frac{3\sqrt{2}}{2}}$$

$$(b) \quad \frac{1}{\sqrt{3}}$$

$$\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{\sqrt{3}}{\sqrt{9}}$$

$$= \boxed{\frac{\sqrt{3}}{3}}$$

$$(c) \quad \frac{2}{\sqrt{5}}$$

$$\frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$

$$= \frac{2\sqrt{5}}{\sqrt{25}}$$

$$= \boxed{\frac{2\sqrt{5}}{5}}$$

(c)

$$\frac{3}{\sqrt{5} - 1}$$

3 Marks Must come in
Exam 2025, 2026, 2027.

$$\frac{3}{\sqrt{5} - 1} \times \frac{\sqrt{5} + 1}{\sqrt{5} + 1}$$

change middle sign
and then multiply
and divide.

conjugate

$$= \frac{3(\sqrt{5} + 1)}{(\sqrt{5} - 1)(\sqrt{5} + 1)}$$

This will come in algebra too.

$$(a-b)(a+b) = a^2 - b^2$$

$$= \frac{3\sqrt{5} + 3}{(\sqrt{5})^2 - (1)^2}$$

$$= \frac{3\sqrt{5} + 3}{5 - 1}$$

$$= \boxed{\frac{3\sqrt{5} + 3}{4}}$$

(ii)

$$\frac{5}{\sqrt{7} - 2}$$

$$= \frac{5}{\sqrt{7} - 2} \times \frac{\sqrt{7} + 2}{\sqrt{7} + 2}$$

$$= \frac{5(\sqrt{7} + 2)}{(\sqrt{7} + 2)(\sqrt{7} - 2)}$$

$$\longrightarrow (a+b)(a-b) = a^2 - b^2$$

$$= \frac{5\sqrt{7} + 10}{(\sqrt{7})^2 - (2)^2}$$

$$= \frac{5\sqrt{7} + 10}{7 - 4}$$

$$= \frac{5\sqrt{11} + 10}{3}$$

$$(iii) \quad \frac{2\sqrt{3}}{\sqrt{11} - 3}$$

$$\frac{2\sqrt{3}}{\sqrt{11} - 3} \times \frac{\sqrt{11} + 3}{\sqrt{11} + 3}$$

$$\frac{2\sqrt{3}(\sqrt{11} + 3)}{(\sqrt{11} - 3)(\sqrt{11} + 3)}$$

$$\longrightarrow \frac{2\sqrt{33} + 6\sqrt{3}}{(\sqrt{11})^2 - (3)^2} \quad \longrightarrow \quad \begin{matrix} (a-b)(a+b) \\ a^2 - b^2 \end{matrix}$$

$$\frac{2\sqrt{33} + 6\sqrt{3}}{(\sqrt{11})^2 - (3)^2}$$

$$= \frac{2\sqrt{33} + 6\sqrt{3}}{11 - 9}$$

$$= \frac{2\sqrt{33} + 6\sqrt{3}}{2}$$

Student
 Parent
 Teacher

} goal $\rightarrow A/A^*$